AF 1742

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Appellant(s):	John F. Breedis, Ronald N. Caron, and Carl L. Deppisch	Docket No.:	101931-100
Serial No.:	09/192766	Examiner:	S. Ip
Filed:	November 16, 1998	Art Unit:	1742
ASSIGNEE:	Olin Corporation		
For:	STRESS RELAXATION RESISTANT BRASS		

Certificate of Mailing

Date of Deposit April 12, 2001.
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Signed: Gregory S. Rosenblatt

Name: Gregory S. Rosenblatt

TRANSMITTAL LETTER FOR APPEAL BRIEF

Commissioner for Patents
U.S. Patent and Trademark Office
Washington, D.C. 20231
Dear Sir:

Enclosed herewith is the Appeal Brief for the above captioned patent application. You are hereby authorized to charge Deposit Account No. 23-1665 in the amount of $310.00 to cover the requisite fee under 37 CFR § 1.17(c). Please apply any credits or charge any deficiencies to our Deposit Account No. 23-1665. Two additional copies of this document are enclosed.

Respectfully submitted,
John F. Breedis, et al.

Gregory S. Rosenblatt
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Date: April 12, 2001 Person Mailing Paper: Gregory S. Rosenblatt

APPELLANTS' BRIEF UNDER 37 CFR 1.192

Assistant Commissioner for Patents
US Patent and Trademark Office
Washington, DC 20231

Dear Sir:

In reference to the above-identified Patent Application, this is an Appeal from the Examiner's Final Rejection (Paper No. 5) mailed July 17, 2000. A Notice of Appeal was filed on January 12, 2001, setting a period for filing this Appellants' Brief that expired March 12, 2001. A Petition for an Extension of Time under 37 CFR 1.136(a) is enclosed extending the period for filing this brief until April 12, 2001.

Reversal of the Examiner's rejection of the pending claims in view of the remarks that follow is respectfully requested.

1. Real Party In Interest

Olin Corporation is the real party in interest, having received the full right, title and interest in patent application serial number 09/192776 by an assignment from all three inventors, John F. Breedis, Ronald N. Caron, and Carl L. Deppisch, executed

November 13, 1998. This assignment was recorded at the U.S. Patent and Trademark Office on November 16, 1998 at reel 9600, frame 0649.

2. Related Appeals and Interferences

The Appellants do not have any related patent applications currently under appeal before the Board of Patent Appeals and Interferences.

3. Status of Claims

Patent application serial number 09/192776 was filed on November 16, 1998 with claims 1-18. By a telephone call on January 21, 2000, the Examiner issued a restriction requirement, requesting that the Appellants elect to pursue prosecution of either the invention of Group I (claims 1-14) or Group II (claims 15-18). The Appellants elected, with traverse, the invention of Group I (claims 1-14).

In an office action mailed February 2, 2000 (Paper No. 3), the Examiner rejected claims 1-14 and withdrew claims 15-18 from consideration. Appellants mailed a response under 37 C.F.R. 1.121 on May 2, 2000 incorporating the limitations of claim 2 into claim 1 and amending claims 3-6 to correct dependency effected by this amendment.

A final office was mailed July 17, 2000 (Paper No. 5) repeating the restriction requirement and rejections of claims 1 and 3-14. In a response under 37 C.F.R. 1.116, mailed January 12, 2001, Appellants cancelled claims 15-18 in accordance with the now final restriction requirement. In addition, a limitation embodied in claims 13 and 14 was added to claim 1 and claims 13 and 14 were cancelled.

Accordingly, claims 1 and 3-12 remain pending in the present patent application. All pending claims are present subject to final rejection and the subject of the present appeal.

4. Status of Amendments

By an advisory action mailed January 31, 2001 (Paper No. 9), the Examiner indicated that the aforementioned January 12, 2001 amendment would be entered upon filing a Notice of Appeal and the present Appeal Brief. A Notice of Appeal was mailed January 12, 2001 and this Appeal Brief is being mailed April 12, 2001.

5. Summary of Invention

As disclosed at page 1, lines 13-27 of the specification of the subject patent application, alpha brasses are single phase alloys of copper and zinc that contain up to

39% of zinc. These alloys generally have good formability, moderate strength, modest electrical conductivity and low cost. These characteristics make these alloys suitable for use in appliance and automotive applications. However, alpha brass alloys have inadequate resistance to stress relaxation and are not suitable for use in environments having operating temperatures significantly above room temperature. By contrast, alloys such as C510 and C425 retain adequate stress relaxation at elevated temperatures, but do not have electrical conductivity sufficient for appliance and automotive applications.

Appellants' invention, as embodied in claim 1 and the claims dependent therefrom, is a brass alloy having improved resistance to stress relaxation as compared to conventional alpha brass alloys. This improved brass alloy consists essentially of an alpha brass base (see page 6, line 148) with the addition of controlled amounts of nickel, tin and phosphorous (see page 4, lines 106-107). As embodied in claim 1, the disclosed brass alloy consists essentially of (by weight): 5% to 25% zinc (see page 13, line 304), 0.3% to 2% nickel (see page 6, lines 163-169), 0.15% to 1% tin (see page 8, lines 213-217), 0.03% to 0.35% phosphorous (see page 7, lines 185-189) and less than 0.1% each of silicon and beryllium (see page 14, line 349 to page 15, line 355). Preferably, the weight ratio of nickel to phosphorous should be between 3.5:1 and 7.5:1 (see page 8, lines 192-195). The Appellants have surprisingly discovered that an alloy meeting this compositional configuration will exhibit improved resistance to stress relaxation while retaining adequate electrical conductivity.

6. Issues

The Examiner rejected all pending claims as obvious and not patentable under the provisions of 35 U.S.C. § 103(a) as follows:

1. Claims 1, 3 and 6-12 in view of JP5-311 292;
2. Claims 1, 3 and 6-12 in view of U.S. Patent No. 4,362,579 to Tsuji, JP4-354 843, JP6-184 679, JP 5-912 674, or JP7-126 779;
3. Claims 1, 3-4 and 6-12 in view of JP5-311 924, JP5-311 925, or JP6-228 684;
4. Claims 1, 3-5 and 7-9 in view of JP4-231 430, JP5-059 467, or JP6-299 275; and,
5. Claims 1 and 3-12 in view of JP6-179 932.

Appellants believe that the pending claims are patentable over the cited references because these references do not recognize the enhanced resistance to stress relaxation achieved when the Ni:P weight ratio is between 3.5:1 and 7.5:1. Accordingly, Appellants believe that the following issue is present for review:

> Whether the unexpected results of the claimed Ni:P ratio is sufficient to overcome the prima facie case of obviousness under 35 U.S.C. § 103(a) asserted by the Examiner?

7. Grouping of Claims

Because the claimed Ni:P ratio is a limitation of claim 1 and the remaining claims are dependent upon claim 1, Appellants believe that all of the claims stand or fall together.

8. Arguments

A prima facie case of obviousness may be rebutted by a showing of unexpected results, i.e., a showing that the claimed invention exhibits some superior property or advantage that a person of ordinary skill in the relevant art would have found surprising or unexpected. In re Geisler, 116 F.3d 1465, 1469 (Fed. Cir. 1997); In re Soni, 54 F.3d 746, 750 (Fed. Cir. 1995). This principle asserts that an invention that yields results that would have been surprising to a person of ordinary skill in a particular art is not obvious. In re Soni, 54 F.3d at 750.

Unexpected results must be established by factual evidence; mere argument or conclusory statements in the specification is not sufficient. In re Geisler, 116 F.3d at 1470. The examiner must consider data in the specification comparing the invention to the prior art (or controls) when determining whether the claimed invention provides unexpected results. In re Soni, 54 F.3d at 750. Furthermore, all evidence of the unexpected properties of the claimed invention must be considered as a whole in light with the prior art. In re Dillon, 919 F.2d 688, 694 (Fed. Cir. 1990), cert. denied, 500 US 904 (1991); see also, Ex Parte Anderson, 1991 Pat. App. Lexis 12, 12 U.SP.Q.2d (BNA) 1241 (1991). In order to be convincing, the objective evidence proffered must be commensurate in scope with the claims to which the evidence is offered to support. In re Tiffin, 448 F.2d 791, 792 (Fed. Cir. 1971); In re Greenfield, 571 F.2d 1185, 1189 (Fed. Cir. 1978).

A. The present patent application provides factual evidence, commensurate with the scope of the claims, demonstrating unexpected properties.

The Appellants disclose various examples of the present invention in which unexpectedly superior characteristics are exhibited.

As described at page 18, lines 447-450, inventive alloy "A" has a Ni:P ratio of 5:1, within the claimed scope of 3.5:1 to 7.5:1. After processing, this alloy had a yield strength of 70 ksi, a tensile strength of 74 ksi, and an electrical conductivity equal to 36% IACS (see page 18, lines 461-464). This alloy retained 87% of its stress after 3000 hours at 125° C and 73% of its stress after 3000 hours at 150° C (see Table 3 at page 12). Similarly, inventive alloy "B", as described at page 19, lines 477-479, has a Ni:P ratio of 5:1, within the claimed scope of 3.5:1 to 7.5:1. After processing, this alloy had a yield strength of 70 ksi, a tensile strength equal to 78 ksi, and an electrical conductivity equal to 28% IACS. This alloy retained 84% of its stress after 3000 hours at 125° C and 62% of its stress after 3000 hours at 150° C (see Table 3 at page 12).

These alloys' characteristics are superior to the alloys of the prior art. More particularly, these alloys have acceptable or better than expected conductivity and strength while displaying markedly improved resistance to stress relaxation as compared to conventional alloys. As stated above, alloys C260, C425, and C510 are typically used in appliance and automotive applications as they exhibit adequate strength and conductivity. However, the use of these alloys are limited by their poor resistance to stress relaxation. These alloys have a yield strength between 68 and 85 ksi, and electrical conductivity between 15% and 28%. Alloys C260, C425 and C510 retained between 48 and 79% stress after 3000 hours at 125° C (see Table 3 at page 12). By contrast, alloys of the present invention have between 84 and 87% stress remaining after 3000 hours at 125°C (see Table 3 at page 12). Accordingly, alloys made in accordance with the present invention exhibit up to 81% more stress remaining under comparable conditions, while retaining adequate electrical conductivity.

After 3000 hours at 150°C, alloys C425 and C510 retained between 48 and 54% stress (see Table 3 at page 12). By contrast, alloys of the present invention have between 62 and 73% stress remaining under the same conditions (see Table 3 at page 12). Accordingly, alloys made in accordance with the present invention exhibit up to 52% more stress remaining under comparable conditions, while retaining adequate electrical conductivity.

B. Appellants' claims are patentable over the cited prior art as the claimed range exhibits unexpected properties not disclosed in the prior art.

The Appellants hereto assert that the claimed range of the present invention produces unexpectedly enhanced results over the ranges of the prior art. Accordingly, the present invention is unobvious and patentable.

More specifically, the Examiner rejected claims 1, 3 and 6-14 under 35 USC 103 as unpatentable over JP 5-311 292. This Japanese reference is drawn to a brass alloy having utility as a component for a heat exchanger having a composition, by weight, of 8-20% zinc, 0.3-1.5% nickel, 0.3-1.2% tin, 0.005%-0.20% phosphorous with the balance being copper. The ratio of nickel to phosphorous is disclosed as ranging from 5 to 50. Appellants have discovered, as disclosed in Appellants' specification at page 8, lines 204-206, that for electrical connector applications, a nickel:phosphorous ratio of less than 7.5:1 achieves both increased yield strength and enhanced resistance to stress relaxation. This is established with reference to Appellants' Figure 1 and the specification at page 8, lines 207-210, where alloy X, with a nickel to phosphorous ratio of 20:1 has both reduced yield strength and reduced resistance to stress relaxation when compared to alloy Y and alloy Z, also referred to as inventive alloys A and B above, each having a Ni:P ratio of 5:1.

While JP 5-311,292 broadly discloses a nickel to phosphorous ratio of between 5:1 and 50:1, there is nothing in the reference to teach or suggest that for electrical connector applications, a critical maximum nickel to phosphorous ratio is 7.5:1. A prima facie case of obviousness may be rebutted by showing improved performance in a "critical" range that is within a range disclosed in the prior art. In re Geisler, 116 F.3d at 1469-70; In re Woodruff, 919 F.2d 1575, 1578 (Fed. Cir. 1990). Criticality is supported upon a showing that the claimed range achieves unexpected results relative to the prior art range. Id. A demonstration of substantially improved unexpected results is sufficient to establish criticality of the claimed range, in the absence of contrary evidence." In re Soni, 54 F.3d at 751.

JP 5-311,292 discloses comparative alloy 13 in reference Table 1. This alloy has a composition of 17.5% zinc, 0.27% nickel, 0.20% tin, 0.05% phosphorous and the balance is copper, having a nickel to phosphorus ratio of 5.4. Furthermore, the reference discloses in paragraph [0039] that comparative alloy 13 had inferior strength and stress related corrosion and cracking resistance. Therefore, there is nothing in JP 5-311,292 to teach or suggest to one skilled in the art to utilize brass alloys at the low end of the claimed nickel to phosphorous ratio to achieve the unexpected results of the Appellants' invention.

Appellants identify that a preferred nickel to phosphorous ratio is 5:1. By contrast, JP 5-311,292 teaches that a ratio of 5.4:1 results in undesired characteristics. It is well established that small changes in percentages of the ingredients often produce alloys of totally different characteristics. Aluminum Co. of America v. Thompson Products, Inc., 122 F.2d 796, 799 (6th Cir. 1941) (internal quotations omitted). Such is the case here. Appellants have surprisingly discovered that when the nickel to phosphorous ratio is maintained around 5:1, an alloy with extraordinary resistance to stress relaxation and superior conductivity is created. Accordingly, Appellants' claims should be allowed over JP 5-311,292.

There is further nothing in JP 5-311,292 reference to teach or suggest the applicability of the reference alloys for use as an electrical connector. It is well established that the discovery of an unobvious property inherent in claimed compounds is sufficient to overcome a showing of obviousness. In re Ruschig, 343 F.2d 965, 978 (CCPA 1965) (internal quotations omitted).

Claims 1, 3 and 6-14 were rejected under 35 USC 103 as unpatentable over United States Patent No. 4,362,579 to Tsuji, JP 4-354,843, JP 6-184,679, JP 59-12674 or JP 7-126,779.

U.S. 4,362,579 discloses a copper-nickel-silicon-zinc alloy that may include one or more optional additions. Both tin and phosphorous are included among the list of potential optional additions. However, not one of the exemplary alloys disclosed in the reference includes both tin and phosphorous. The reference discloses a nickel range of between 0.4 and 8 and an optional phosphorous range of between 0.001 and 0.1. These values correspond to a nickel to phosphorous ratio of between 4:1 and 8,000:1. Furthermore, there is nothing in the reference to teach or suggest a critical maximum nickel to phosphorous ratio of 7.5:1 for enhanced electrical properties. In addition, the reference specifies that a minimum of 0.1 silicon is required in the reference alloys. While there may be minimal overlap with Appellants' claimed value of less than 0.1% of silicon, the reference leads one skilled in the art to higher silicon contents; not to a limitation of the nickel to phosphorous weight ratio.

In view of U.S. 4,362,579 neither teaching nor suggesting a critical maximum nickel to phosphorous ratio of 7.5:1 and further leading one skilled in the art to silicon contents greater than 0.1, Appellants' claims are neither taught nor suggested by the cited references. Accordingly, Appellants' claims should be allowed over U.S. 4,362,579.

JP 4-354,843 discloses a copper base alloy containing 7-18% zinc, 0.5-3.0% nickel, 0.5-2.0% tin and 0.01-0.20% phosphorous. The alloy is disclosed as useful in the manufacture of heat exchangers.

There is no recognition of the significance of the nickel to phosphorous ratio apparent from the translated abstract and the table at page 4 of the Japanese publication. However, with reference to that table, the exemplary alloys have a nickel to phosphorous ratio of between 10:1 (alloy number 11) and 29.33:1 (alloy number 3).

There is nothing in JP 4-354,843 to teach or suggest that for electrical connector applications a maximum nickel to phosphorous ratio of 7.5:1 provides enhanced properties. Accordingly, Appellants' claims should be allowed over the cited Japanese reference.

JP 6-184,679 discloses a copper base alloy containing 5-30% zinc, 0.5-2.5% tin, 0.005-0.4% phosphorous and the balance is copper. In reference table 1, alloys 2 and 3 further contain nickel. However, in alloy 2, the phosphorous content, 0.006%, is less than the minimum claimed by Appellants. In alloy 3, the nickel content, 0.18%, is less than that claimed by Appellants. There is nothing in JP 6-184,679 to teach or suggest a copper alloy for use as an electrical connector having zinc, nickel, tin and phosphorous all within the ranges claimed by the Appellants and having the claimed Ni:P ratio. Appellants' claims should be allowed over the cited reference.

At column 1, lines 6-7, it appears that JP 6-184,679 discloses a range of 0.01 to 1.0 nickel. If this is correct, then the reference discloses nickel to phosphorous ratios of between 0.025:1 and 200:1. There is nothing in the reference to teach or suggest that to obtain superior properties for an electrical connector, the nickel to phosphorous ratio should be maintained between 3.5:1 and 7.5:1. Appellants' claims should be allowed over the cited reference.

JP 59-126,742 discloses a copper alloy useful as a welded tube for a radiator. The copper alloy contains 25-40% zinc, 0.005%-0.070% phosphorous, 0.05-2.0% nickel and 0.05-1.0% tin. There is only minimal overlap at 25% zinc in the broadly disclosed reference composition. Not one of the alloys in reference table 1 has between 5 and 25%, by weight, of zinc as claimed by Appellants. There is nothing in JP 9-126,742 to teach or suggest the applicability of the copper alloy for use as an electrical connector. There is further nothing in the reference to teach or suggest a copper alloy with 25% zinc as a maximum as opposed to a minimum or a critical Ni:P ratio of between 3.5:1 and 7.5:1. Appellants' claims should be allowed over the cited reference.

JP 7-126,779 discloses a composite material having a copper alloy substrate that contains between 0.1 and 15% nickel, 0.1 and 10% tin and 0.005 and 0.5% phosphorous.

From column 1 of page 2 of the Japanese reference, it appears that numerous other elements may be present in amounts of between 0.01 and 40%. Among the voluminous list of other elements is zinc. The broadly disclosed nickel:phosphorous ratios range between 0.2:1 and 3,000:1. There is nothing in the reference to teach or suggest a copper alloy for connector applications in which the nickel to phosphorous ratio is maintained between 3.5:1 and 7.5:1. Rather, in the table at the top of page 5, exemplary alloys 1 and 2 are zinc-free and have nickel:phosphorous ratios between 21.4:1 and 27.3:1. The only other disclosed alloy contains zinc but appears to be free of nickel, tin and phosphorous. There is nothing in the reference to teach or suggest a brass alloy suitable for use as an electrical connector as claimed by the Appellants. Appellants' claims should be allowed over JP 7-126,779.

Claims 1, 3-4 and 6-14 were rejected under 35 U.S.C. 103 as unpatentable over JP 5-311,294; JP-5-311,295 or JP 6-228,684.

JP 5-311,294 discloses a copper alloy suitable for use as a heat exchanger. The alloy contains zinc, nickel, tin, phosphorous and boron. The nickel to phosphorous ratio is maintained at 15.0:1. There is nothing in JP 5-311,294 to teach or suggest a copper alloy suitable for use as an electrical connector having a nickel to phosphorous ratio of between 3.5:1 and 7.5:1. Appellants' claims should be allowed over the cited Japanese reference.

JP 5-311,295 discloses a copper alloy suitable for use as a heat exchanger that contains zinc, nickel, tin, manganese, and phosphorous. The alloy has a nickel to phosphorous ratio of 19.2:1. There is nothing in JP 5-311,295 to teach or suggest a copper alloy suitable for use as electrical connector with a nickel to phosphorous ratio of between 3.5:1 and 7.5:1. Appellants' claims should be allowed over the cited reference.

JP 6-228,684 discloses a copper alloy useful as an electrical connector that contains zinc, nickel, silicon, tin, iron, phosphorous and either magnesium or calcium. From the abstract of the disclosure, the nickel to phosphorous ratio may range between 0.5:1 and 3,000:1. There is nothing in the reference to teach or suggest the beneficial effect achieved by maintaining the nickel to phosphorous ratio in the range of 3.5:1 and 7.5:1. Appellants' claims should be allowed over the cited reference.

Claims 1, 3-5, and 7-9 were rejected under 35 USC 103 as unpatentably over JP4-231 430, JP5-059 467 or JP6-299 275.

JP 4-231,430 discloses a beryllium copper alloy that may contain one or more additional elements. Among the extensive list of elements that can be added are nickel, zinc, tin and phosphorous. As these are optional elements, there is no recognition of maintaining a nickel to phosphorous ratio. However, within the ranges disclosed for these additions is a nickel to phosphorous ratio range of between 0.002:1 and 5,000:1. The

reference further teaches 0.1% beryllium as a minimum as opposed to a maximum as claimed in Appellants' claims.

There is nothing in the reference to teach or suggest a copper alloy suitable for use as an electrical connector with a nickel to phosphorous ratio in the range of 3.5:1 to 7.5:1 and a maximum of 0.1% beryllium. Appellants' claims should be allowed over the cited Japanese reference.

JP 5-059,467 discloses a copper alloy that contains tin, phosphorous and magnesium. Optionally, the alloy may contain between 0.01 and 15% zinc. There is nothing in the reference to teach or suggest an inclusion of nickel or the benefit achieved to a copper alloy useful as an electrical connector material when nickel and phosphorous are present in specified ratios. Appellants' claims should be allowed over the cited reference.

JP 6-299,275 discloses an electrical alloy containing zinc, tin, iron and phosphorous and optionally either nickel and/or silicon. The presence of nickel as solely an optional addition indicates no recognition of the benefits obtained by a copper alloy having a controlled nickel to phosphorous ratio. When nickel is present, the reference discloses nickel to phosphorous ratios of between 0.4:1 and 120:1. There is nothing in this reference to teach or suggest that superior characteristics may be achieved at a Ni:P ratio of between 3.5:1 and 7.5:1. Appellants' claims should be allowed over the cited reference.

Claims 1 and 3-14 were rejected under 35 U.S.C. 103 as unpatentable over JP 6-179,932. The reference discloses a copper alloy containing zinc and magnesium and may further contain one or more of additional elements. Among the specified additional elements are tin, phosphorous and nickel. In addition, zinc may be present in an amount of 0.01-15%. Both nickel and phosphorous are disclosed as optional elements and there is nothing in the reference to teach or suggest that by maintaining a nickel to phosphorous ratio of between 3.5:1 and 7.5:1 beneficial properties for an electrical connector are achieved. Within the ranges promulgated for nickel and phosphorous, the reference discloses ratios of between 0.0025:1 and 400:1. Appellants' claims should be allowed over the cited reference.

9. Appendix

A copy of the claims pending in this Appeal are appended to the Appellants' brief.

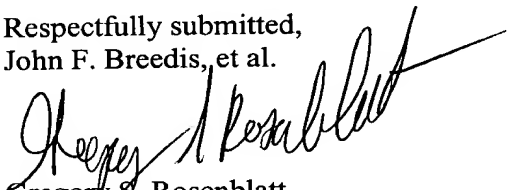
10. Payment of Requisite Fees

Appellants have submitted under separate cover an authorization of the payment of the requisite fees under 37 C.F.R. § 1.17(c). Please apply any credits or charge any deficiencies to our Deposit Account No. 23-1665.

11. Conclusion

It is respectfully solicited that the Honorable Board of Patent Appeals and Interferences consider the foregoing remakes and reverse the Examiner's rejection and allow the pending claims to issue. If the Honorable Board has any questions, it is invited to contact Appellant's attorney at the telephone number listed below.

Respectfully submitted,
John F. Breedis, et al.



Date: April 12, 2001

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1. A brass alloy, consisting, by weight, essentially of:
from 5% to 25% of zinc;
from 0.3% to 2% nickel;
from 0.15% to 1% tin;
from 0.03% to 0.35% phosphorous with a nickel to phosphorous weight ratio, Ni:P, of from 3.5:1 to 7.5:1; and
less than 0.1%, each, of silicon and beryllium; and,
the balance copper and inevitable impurities, said brass alloy having an electrical conductivity in excess of 25% IACS and suitable for forming into an electrical connector.

3. The brass alloy of claim 1 wherein said nickel and said phosphorous are present in an amount effective to provide a nickel:phosphorous weight ratio of about 5:1.

4. The brass alloy of claim 1 further including between 0.07% and 0.12% of iron.

5. The brass alloy of claim 1 further including from about 2 ppm to about 50 ppm of oxygen, sulfur, carbon or a mixture thereof.

6. The copper alloy of claim 1 wherein said zinc is present in an amount of from 8% to 25%.

7. The copper alloy of claim 3 wherein said nickel is present in an amount of from 0.3% to 1%.

8. The copper alloy of claim 7 wherein said tin is present in an amount of from 0.2% to 0.7%.

9. The copper alloy of claim 8 wherein said phosphorous is present in an amount of from 0.05% to 0.18%.

10. The copper alloy of claim 6 wherein said tin is present in an amount of from 0.2% to 0.7%.

11. The copper alloy of claim 10 wherein said zinc content is about 10.2%, said nickel content is about 0.50%, said tin content is about 0.30% and said phosphorous content is about 0.10%.

12. The copper alloy of claim 10 wherein said zinc content is about 19.8%, said nickel content is about 0.50%, said tin content is about 0.51% and said phosphorous content is about 0.11%.

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